Annual Project Summary

Paleoseismic investigation of the southern Rodgers Creek fault, Martinelli Ranch, Sonoma County, CA

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INVESTIGATIONS UNDERTAKEN

The 60-km-long Rodgers Creek fault, located between San Pablo Bay and Santa Rosa, California, strikes approximately N35°W, and is characterized by a late Holocene right-lateral slip rate of 6.4 to 10.4 mm/yr (Budding et. al, 1991; Schwartz et. al, 1992). The Rodgers Creek fault is one fault in a series of right-stepping *en-echelon* faults that include the Hayward fault to the south, and the Healdsburg and Maacama faults to the north (Figure 1). The surface expression of the Rodgers Creek fault, as mapped by Randolph and Caskey (2001) and Hart (1992), includes classic geomorphic features such as offset drainages, sidehill benches, tonal lineaments, sag ponds, and springs.

The Working Group on California Earthquake Probabilities (WGECP, 2003) defined the Hayward-Rodgers Creek fault system as having the greatest probability (27%) of generating an earthquake of M 6.7 or greater. However, data used to develop the probabilities for the Rodgers Creek fault are based on findings from only two studies along the central fault trace (Budding et. al, 1991; Schwartz et. al, 1992). Additional paleoseismic data from the southern part of the fault is critical to gain a greater understanding of the timing of large paleoearthquakes for the Rodgers Creek fault, and for assessing seismic hazards and calculating probabilities of large earthquakes in the populated San Francisco Bay area.

This study was a limited scope investigation to evaluate the late Holocene geomorphic and fluvial stratigraphic context of the site as well as to assess the potential for obtaining data on the MRE for the Rodgers Creek fault. The scope of the study included: (1) field reconnaissance and review of aerial photography; (2) preparation of a site topographic map; (3) construction of a detailed geomorphic and fault lineation map; (4) excavation and documentation of two test pits, and two creekbank exposures to evaluate the site stratigraphy; and (5) collection of material to be evaluated by radiocarbon analyses and possibly pollen dating. Field reconnaissance to supplement existing mapping along the southern Rodgers Creek fault (Randolph and Caskey, 2001) was used to identify a site where the fault crosses late Holocene and historic terraces along Champlin Creek near Highway 116 (Figure 2).

PRELIMINARY RESULTS

Preliminary results of our investigation indicate that the late Holocene Champlin Creek stream bank deposits preserve evidence for the most recent event along this trace of the southern Rodgers Creek fault. At least four terrace surfaces, and one buried terrace were mapped, and all appear to range from historic to Holocene in age. This estimate is based on the historic artifacts found in two of the deposits and the degree of pedogenic development evaluated on the oldest deposits. Three of the terrace deposits do not preserve evidence of faulting, and appear to post-date the most recent event on the fault.

In the creek bank exposure, a strath terrace cut into Tertiary volcanic bedrock and overlying terrace gravels are faulted with a west-side-up sense of movement. In this location, the apparent oblique-reverse movement of the fault has juxtaposed Tertiary bedrock over the Holocene terrace gravels. The fault strands terminate upward at the base of the younger overlying terrace deposit, thus providing constraint on the timing of the most recent event on this trace of the fault.

Charcoal samples were collected for radiocarbon analysis where available, as well as bulk samples for possible pollen dating. The results of radiometric dating on the older and younger terraces deposits will provide constraints on the timing for the most recent event that occurred on this trace of the southern Rodgers Creek fault.

In the coming weeks we plan to finalize the detailed exposure logs, and complete the final fault and geomorphic map of the site, including surveyed topography. Based on the results of our analyses, we will attempt to provide new information for the event chronology and history of earthquakes on the southern Rodgers Creek fault.

NON-TECHNICAL SUMMARY

This research provides information on timing of past large earthquakes along the southern Rodgers Creek fault in northern California. There have been no historic major earthquakes documented on the fault, with existing paleoseismic evidence indicating that the most recent event may have occurred approximately 230 years ago (Budding et. al, 1991). The timing and recurrence of earthquakes along the Rodgers Creek fault is a critical issue for determining seismic hazard in northern California. This paleoseismic study will help provide additional information that will be used to evaluate the probabilities of strong ground motions and other earthquake-related hazards in northern California.

REPORTS PUBLISHED

None.

DATA AVAILABILITY

Additional detailed information on the investigation is available from the Principal Investigators listed above. This information includes detailed site maps and logs of trenches.

REFERENCES

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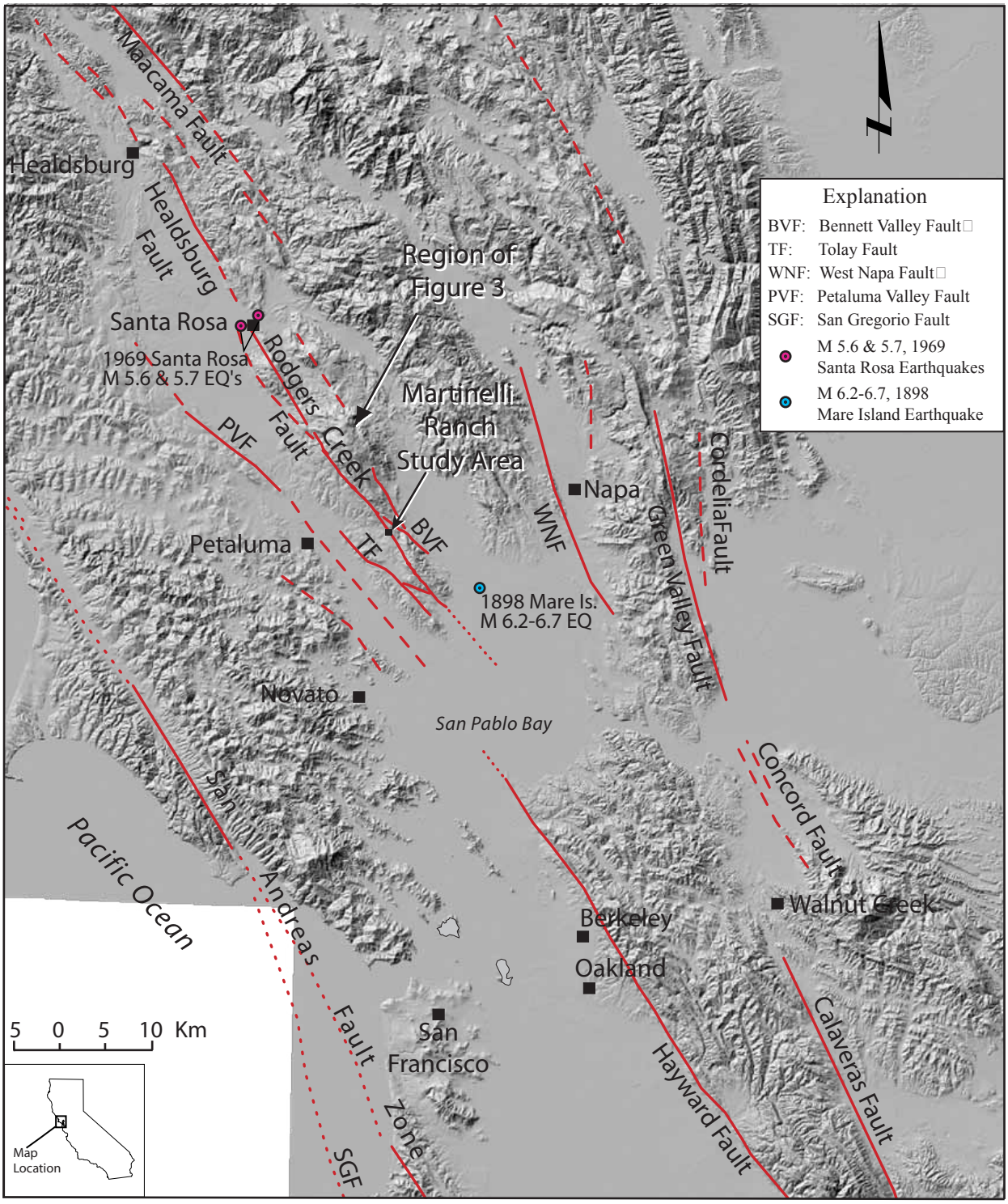

Figure 1 Regional Location Map showing faults modified from Jennings (1994); the historic earthquakes of 1969 & 1898; and the proposed Martinelli Ranch study area.

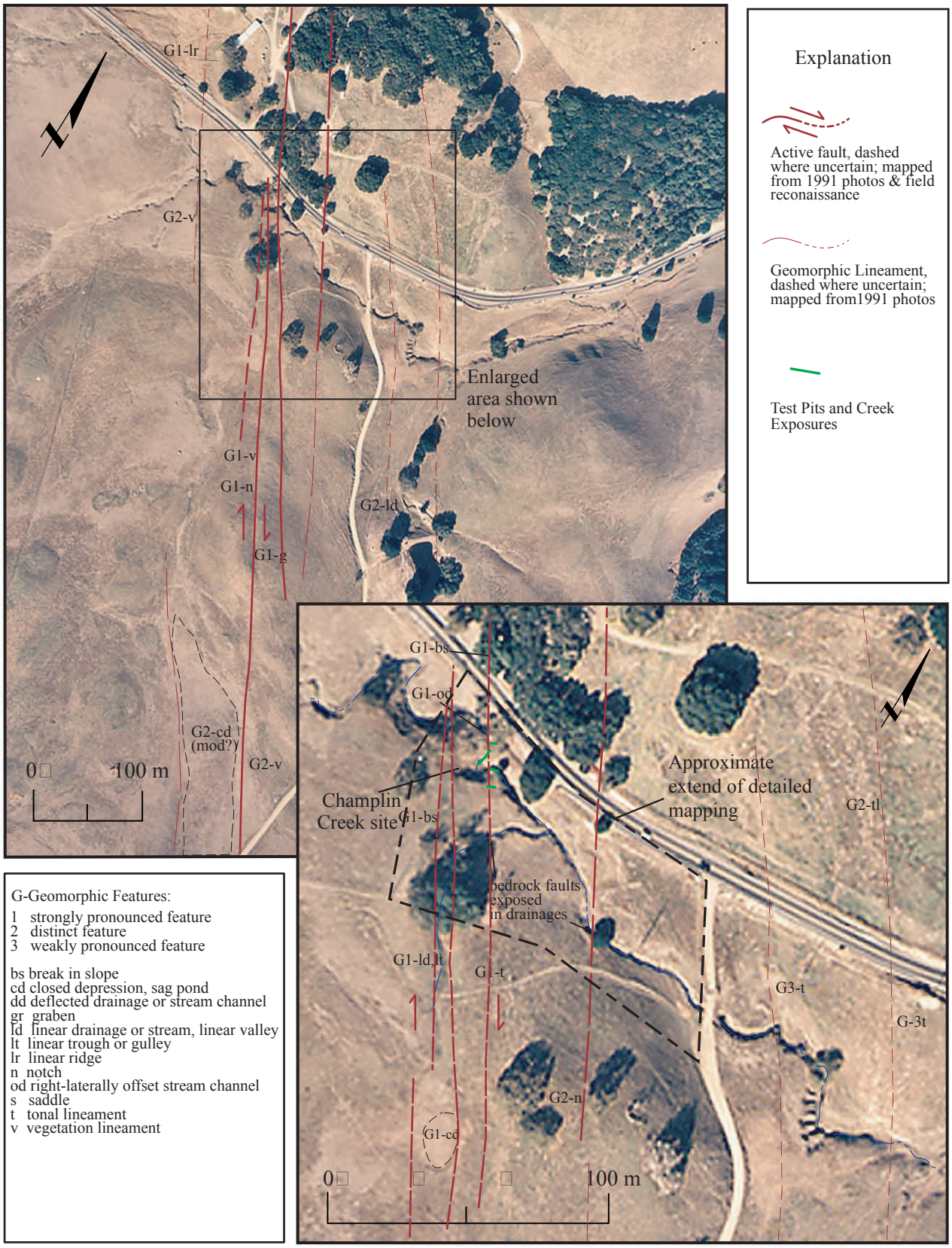

Figure 2 Aerial Photograph (1991), with mapped fault traces, lineaments and geomorphic features. Proposed trench site along Champlin Creek shown.